

This manual must be kept with the appliance

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Part No. S159

SOLARflo

Installation manual



Working towards
a cleaner future





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Andrews Storage Water Heaters have been designed and manufactured to comply with current International standards of safety. In the interests of the health and safety of personnel and the continued safe, reliable operation of the equipment, safe working practices must be employed at all times. The attention of U.K. users is drawn to their responsibilities under the Health and Safety Regulations 1993.

All installation and service on the Andrews Water Heater must be carried out by properly qualified personnel, and therefore no liability can be accepted for any damage or malfunction caused as a result of intervention by unauthorised personnel.

The Andrews Water Heaters policy is one of continuous product improvement, and therefore the information in this manual, whilst completely up to date at the time of publication, may be subject to revision without prior notice.

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GENERAL INFORMATION

The SOLARflo systems have been designed and selected to offer a complete solar package to provide Domestic Hot Water (DHW) with maximised contribution from solar irradiation for commercial systems.

The systems offer solutions for a variety of applications, to deal with the larger applications associated with commercial systems as well as dealing with higher storage temperatures and legionella.

The systems break down into equipment sub-sections:

THE SOLAR SIDE

The Solar Collectors.

A Controller to control the solar gain and integrate the top up heating.

Solar pumping system

Solar pipe-work ancillary equipment including expansion system.

THE DHW SIDE

The DHW generation and storage system

De-stratification/anti-legionella pumping system

DHW expansion system

Cold water feed equipment

Primary heating system

DHW top up system (Pre-heat system only)

Various systems can be designed to best suit operation of the package. The system will then determine what equipment is required. The type of equipment will then determine the operation and installation requirements.

Andrews Water Heaters, offer a standard simple system based on single solar field, single vessel (see Fig 3). However alternative systems are available to best suit the application.

EQUIPMENT SELECTION:

The equipment selection can be based upon duty and operation.

Andrews Water Heaters offer a set of standard packages to cover a large percentage of requirements based on a simple solar thermal system.

SEE TABLE OPPOSITE FOR A GENERAL INDICATION OF EQUIPMENT DESCRIPTION AND SELECTION POSSIBILITIES. THE TABLE ALSO SHOWS THE SCOPE OF STANDARD SYSTEMS ONLY.

The packages are split into pre-heat system with a single coil unit and combined system with a secondary coil.

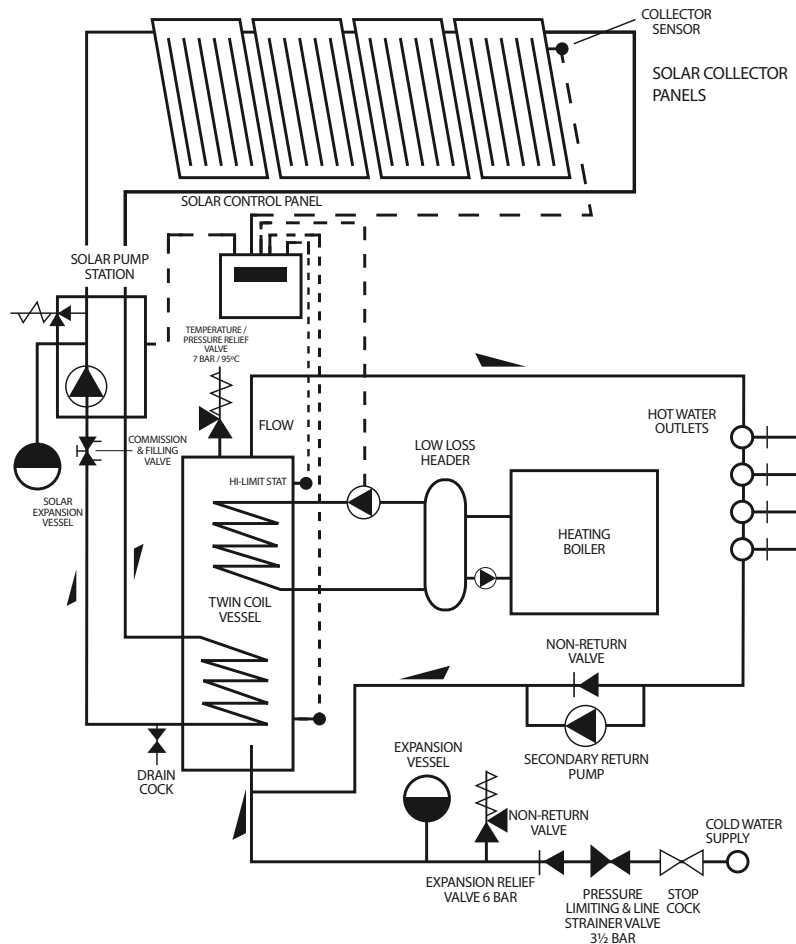
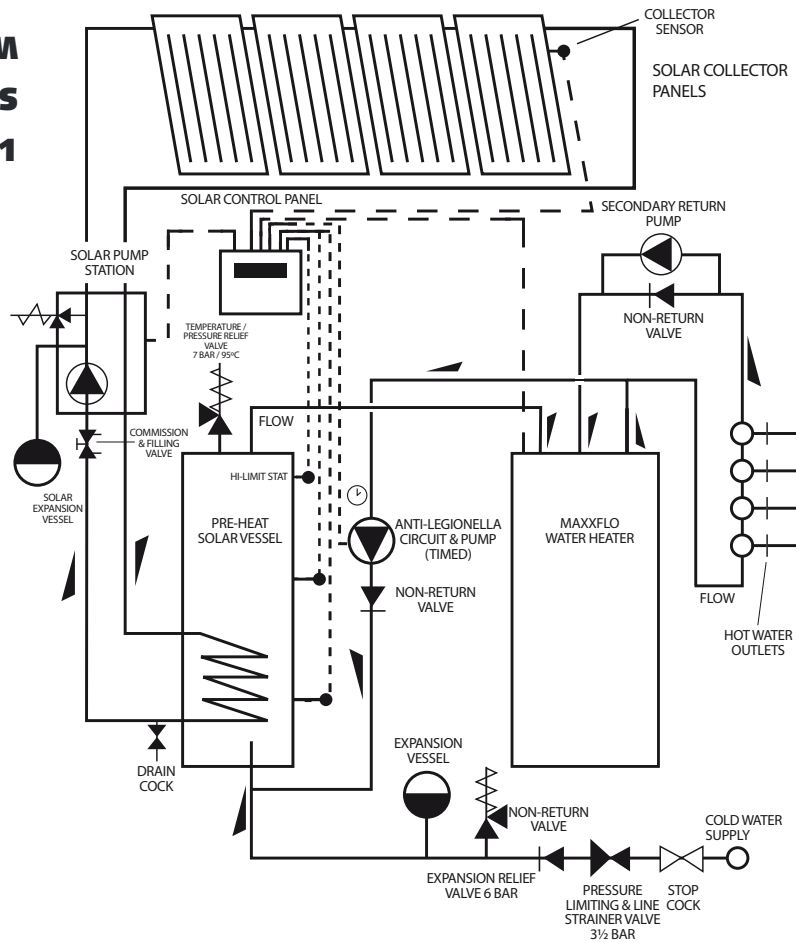
SYSTEM SELECTION.

Alternative systems are available and are discussed in the operation section of this manual. Any specific information will be supplied with the package.

Other systems available on the SOLARflo systems include, multi-vessel, multi-solar field, plate heat exchanger systems, dump valves.

REF	CIRCUIT	EQUIPMENT	
1	SOLAR	Solar collectors GLAZED FLAT PLATE	Collects both direct and diffuse solar radiation and transfers it to the water medium. GLAZED FLAT PLATE: Insulated frame with copper pipe-work welded to an absorption plate. This is covered with special glass (with low thermal expansion co-efficient) to allow maximum radiation to pass through but to limit heat loss.
2	SOLAR	A controller to control the solar gain and integrate the 'top up' heating.	A specific controller designed to offer pump control and temperature sensing to allow solar heat collection. Its main function is to check difference between storage and collector; temperatures to decide when heat gain is achievable. This controller however also covers many other functions including primary heating and legionella control.
3	SOLAR	Solar pumping system	Comprising solar pump, mounting pipe-work, flow regulator, air eliminator, isolation, relief valve and connections for the expansion line. This is generally combined with the pipework ancillaries and expansion vessel to form the ANDREWS SOLAR STATION.
4	SOLAR	Solar pipe-work ancillary equipment including expansion system.	The interconnecting pipe-work is supplied and fitted by the installer. The connecting pipework on the 'Solar Station' is supplied and factory fitted by Andrews Water Heaters. This also includes the solar expansion vessel (to absorb expansion due to temperature and vapourisation of fluid within the Solar Collector), drain/vent/fill connection and optional automatic air eliminator.
5	DHW	The DHW storage cylinder(s) SINGLE COIL PRE-HEAT or TWIN-COIL COMBINED	This will be either a PRE-HEAT (single coil) OR A TWIN-COIL COMBINED CYLINDER. It comprises a stainless steel cylinder either the one lower coil or twin coils (higher and lower). The lower coil transfers the heat from the solar circuit. The higher coil (where supplied) heats the upper section using primary heat at 82°C or an immersion heater. Where no top heater is used the DHW water passes to another heating 'top up' system.
6	DHW	DHW expansion system	Expansion vessels sized to accommodate the expansion due to temperature increase. The equipment also includes expansion relief valve and lockshield valve.
7	DHW	De-stratification/anti-legionella pumping system	A DHW pump with valves. On a twin-coil cylinder destratification loop the pipe-work connects the top of the cylinder to the bottom. It is designed to take the whole cylinder up to a temperature and eliminate stratification. In a single coil unit the bottom coil of the cylinder is connected to the DHW outlet of the primary DHW heating system.
8	DHW	Cold feed equipment	Consisting strainer isolation and check valve (possibly combined). Fitted to the cold water inlet supplying the DHW vessel.
9A	PRIMARY SYSTEM		This can be a variety of equipment either supplied as part of a package or supplied by others. This can vary from no primary system, to a direct fired water heater, a single primary actuator to a full primary boiler system with separate controls. It is designed to supply primary hot water as 'top up'/back up to the solar heating. In general it can be a complete system of its own.
9B	DHW TOP UP		This equipment is used when a PRE-HEAT DHW cylinder is used. This can be a variety of equipment designed to heat the DHW to required water temperature. This can be used in conjunction with the primary heating system.

**SYSTEM
SCHEMATICS
FIG 1**



BASIC OPERATION: (SEE FIG 1)

Solar irradiation energy incident on the the solar collectors is transfered (in the form of heat energy) to the solar circuit fluid. The circuit fluid is pumped around the system, transferring this heat energy to the storage cylinder, indirectly via a coil.

In **Glazed Flat Plate Collectors** heat is transferred to copper pipes carrying the heat transfer fluid with the assistance of an absorber plate. This is located within an insulated frame with a glass cover. This allows solar radiation to pass through but limits the heat lost through convection and conduction.

The fluid is transferred around the circuit by a pump. This is switched on, when the temperature or the surface of the collector absorber (for glazed flat plate collectors) or the fluid exit temperature (for evacuated tube collectors) is greater (by a fixed differential) than the solar portion of the DHW cylinder. The energy from the collectors will be transferred to the water in the storage cylinder.

As the solar circuit is a closed system expansion vessels and relief valves are required.

The collectors are generally arranged in **FIELDS** (an array of collectors). Each field located differently to maximise the irradiation collection throughout the day as the sun moves through the sky. Normally only one field is used placed in the optimum position. Multiple fields are used when a more even heat gain is required throughout the day, space is limited or where not one available location is ideal.

The solar irradiation can not always supply the DHW required at times of demand. Also dependant on time of the day or month of the year there could be no solar contribution. A 'top up' system ensures that there will always be DHW available at the correct temperature. The 'top up' system must always be sized on the basis of no solar contribution being available to ensure the DHW demand can be satisfied.

We have two types of systems for utilising 'top up', combined and pre-heat:

In a **combined system** (twin coil/immersion heater) the same cylinder is used to reach the desired water temperature via two coils. A lower coil is used to transfer the solar heat to the lower section of the cylinder, a higher coil heats the upper section using high grade heat from, for example, a heating system or an electric immersion heater.

In the SOLARflo systems a full primary heating system can be included, utilising dedicated or non-dedicated boilers. If a primary system is already available this can be diverted via a pump, or valve or an immersion heater installed. The SOLARflo system can offer control/communication of this primary section in order to maintain the water temperature within the cylinder.

COLLECTORS**FIELDS****'TOP UP'****COMBINED
SYSTEM**

**PRE-HEAT
SYSTEM**

In a **pre-heat system** the water in the cylinder is heated only by the solar. This is discharged to a secondary device e.g storage calorifier/direct-fired water heater. These can be supplied as part of the SOLARflo system. If the secondary device requires primary hot water a primary system can be included.

The standard systems supplied with SOLARflo use direct gas fired water heaters.

The 'top up' system is also required to ensure anti-legionella temperatures are reached and de-stratification measures can take place

LEGIONELLA

One of the main differences between commercial and domestic solar thermal systems is the requirements of L8, the control of legionella. Temperatures must be able to achieve 60°C and above. The 'top up' system must take the storage water to 60°C if the solar energy is not able to do so.

DESTRATIFICATION

Destratification equipment is supplied on both types of systems to ensure all the water within the cylinder is heated to anti-legionella temperatures.

For pre-heat systems the water is taken from the outlet of the 'top up' system and fed to the bottom of the solar cylinder. For combined cylinders with twin-coils a destratification loop pumps hot water from the top of the cylinder to the lower section.

CONTROL

The controller is designed to integrate the whole SOLARflo system from solar pump control to operation of the destratification cycle.

OVERALL GENERAL SPECIFICATION OF THE SOLARflo SYSTEM.

DESCRIPTION:	SOLARflo
MANUFACTURER:	Andrews Water Heaters
TECHNICAL DETAIL:	
Vessel Sizes:	450, 550, 700, 900 (Litres)
Max Flow Rate: (solar circuit)	30 l/min
Max Pressure Drop:(solar circuit)	See curve in pump station instructions
Pressure: (solar circuit)	Max 6bar(g)
Temperature: (solar system)	120°C. Higher Temperatures will occur*
Pressure: (dhw system)	Standard 3.5bar
Temperature: (dhw system)	Operating 60°C Max 95°C
Electrical:	Controller 230V/1ph/50hz, 4Amps Pump station is powered and controlled by the controller. This does not include any immersion heaters.
Sensors:	PT1000
DHW Heating Vessels:	Combined (twin coil or coil and immersion heater) Pre-heat (single coil)
Top Up Systems for Preheat	MAXXflo gas fired condensing water heater
Primary Heating	Valve control Enable signal Immersion heater (3kWe, 6kWe, 9kWe, 12kWe) Boiler system

FEATURES

- PRIMARY** Please refer to the Technical Specification Appendix for details of the individual equipment.
- SYSTEMS** The overall specification sheet will indicate specific supply of the system supplied.

GENERAL WARNINGS:

The solar system should never be left with water in and not fully commissioned. If commissioning can not take place, the unit should be left with no water content or the collectors covered.

Both circuits contain unvented systems. Please ensure all relevant relief valves and associated expansion equipment are fitted. This includes any equipment not supplied by Andrews Water Heaters. The installation should only be carried out by a competent person as per the Building Regulations.

Solar collectors are both high temperature water and steam generators. Therefore high pressures and temperatures can be generated. The collectors and associated equipment have been designed for these conditions. However the collectors should be treated with precautions associated with high temperature/pressure systems.

Full Health and Safety regulations should be followed for all aspects of installation.

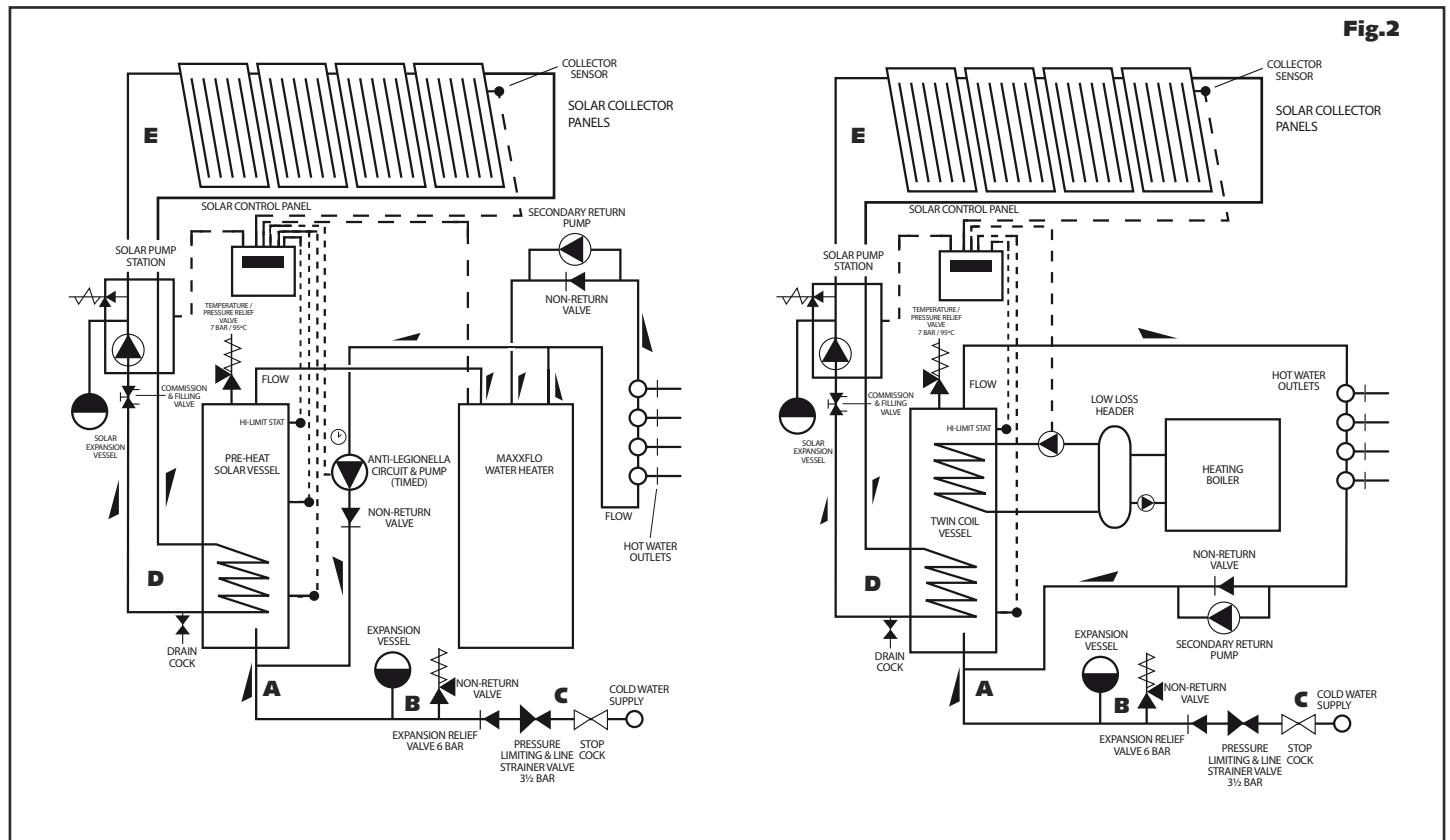
IMPORTANT INSTALLATIONS NOTES

1. **ENSURE THE INSTALLATION IS CARRIED OUT AS PER THE APPROPRIATE SYSTEM SCHEMATIC AND THAT ALL EQUIPMENT IS INCLUDED AND INSTALLED CORRECTLY.**
2. **COLLECTORS ARE INSTALLED AT THEIR OPTIMUM ORIENTATION AND ANGLE TO MAXIMISE SOLAR CONTRIBUTION. SEE TECHNICAL SPECIFICATION SECTION.**
3. **ENSURE PIPE-WORK IS AN APPROPRIATE SIZE FOR FLOW RATES.**
4. **FOR COPPER PIPE-WORK ONLY BRAZED OR COMPRESSION/SCREWED CONNECTIONS SHOULD BE USED, APPROPRIATE FOR THE HIGH TEMPERATURES >215°C.**
5. **APPROPRIATE EXPANSION VESSELS AND RELIEF VALVES SHOULD BE INSTALLED ON BOTH SOLAR AND DOMESTIC HOT WATER SIDES OF THE SYSTEM.**
6. **THE SOLAR SYSTEM SHOULD ONLY BE FILLED USING THE SUPPLIED GLYCOL/WATER MIX. IT IS RECOMMENDED THAT THIS IS USED FOR TEST FILLS DUE TO THE DIFFICULTIES IN DRAINING DOWN THE ENTIRE WATER CONTENT IN THE COLLECTORS.**
7. **THE ANDREWS SOLARflo SYSTEM REQUIRES 230V, 4AMP (OTHER SYSTEMS MAY REQUIRE MORE). THE POWER SUPPLY TO THE CONTROLLER MUST BE ABLE TO BE ISOLATED CLOSE TO THE UNIT. A SEPERATE 230V PLUG SOCKET MUST ALSO BE AVAILABLE FOR COMMISSIONING.**

IF IN DOUBT ASK

PIPEWORK

The equipment supplied by Andrews Water Heaters is designed to be easy to install due to its module supply. The interconnecting pipe-work is schematically shown in Fig 2.



Please refer to the individual equipment and relevant standards for full requirements of connection.

DHW

CONNECTIONS A,B,C

All pipe-work must be suitable for potable water, this would be generally copper, a suitable grade of stainless steel, or plastic.

IMPORTANT:

Due to the potentially high temperatures in the solar circuit, suitable materials should always be used. **Soft solder should not be used with copper**, the pipe-work should be preferably brazed or compression fittings used. The number of joins should be limited.

As the heat transfer fluid in the solar circuit contains a water/glycol mix it is recommended that the discharges of relief valves are not put to drain. The relief valve connection (located on the pump station) should be connected back into the original fluid container (located on the back of the solar station). SEE SOLAR STATION. This is to prevent loss of the fluid to drain.

All fittings are best placed on the return line from the solar coil to the collectors. This ensures equipment is only exposed to the cooler temperatures within the circuit.

STAINLESS STEEL FLEXIBLE PIPE:

The stainless steel flexible pre-insulated pipe is available in sizes DN20, DN25 and DN32.

This pipe is pre-insulated and is supplied with electrical wire for connecting the collector sensor to the solar control unit already integrated.

SOLAR PIPE WORK

CONNECTIONS: D,E

Fig. 2 shows the required connections for standard supply (solid lines). The individual connection points can be seen in the installation instructions for the particular item of equipment. This will also show how to connect multiple collectors together.

Connection D: This is the pipe-work in the vicinity of the solar station. The distance of this pipe-work is usually small and is therefore economical to use copper. If the distances are quite large in this area the resultant pressure drop has to be taken into consideration. Both the air eliminator (if used) and drain/fill valve should be fitted in the RETURN line.

Connection E: This is the long flow and return line to the collectors and can run for many meters. For medium distances 20-30m and/or with many potential bends flexible pipe-work is recommended to reduce fitting time. For long straight runs copper is best used to reduce cost and the pressure drop. A combination of both will generally give the best results.

INSULATION

The stainless steel flexible pipe comes pre-insulated with insulation suitable for external use, is tolerant of high fluid temperatures and resistant to ultra-violet radiation. If this pipework is not used appropriate insulation has to be fitted and insulated appropriately with a UV stable coating.

**VENT AND DRAIN
(SOLAR D & E)****Vent**

The SOLARflo system is designed not to require vents positioned in inaccessible high locations. A jet pump will be used to fill the system during commissioning by Andrews Water Heaters which will eliminate air within the system.

WARNING: THE HEAT TRANSFER FLUID WITHIN THIS CIRCUIT CAN REACH HIGH TEMPERATURES CREATING HOT WATER AND STEAM.

Drain

A fill/drain valve is supplied with the SOLARflo system. This should be fitted at the lowest level of the system. If this is not used or cannot be installed in the lowest position, or the pipe-work is creates potential traps, extra drains should be installed. These should be HT fittings.

SEE WARNING ABOVE REGARDING HIGH TEMPERATURES.

SOLAR COLLECTORS

PLEASE REFER TO FULL INSTALLATION INSTRUCTIONS REGARDING APPROPRIATE COLLECTORS AND MOUNTING EQUIPMENT.

The collectors should be only fitted by suitably trained/qualified installers. Collectors are usually located at height and therefore must be installed by competent persons. Collectors will be fitted on a variety of roof types. Incorrect installation of the collectors or incorrect assessment of the roof could lead to damage of the collectors, damage to the roof which could lead to severe damage to the building and potential physical injury.

The collectors should be installed at the optimum angle and direction for solar collection, advice can be obtained from Andrews Water Heaters.

To minimise the requirement for roof access, all roof height equipment is limited. There is no requirement at high level for vent valves or automatic air vents.

The designed system will usually require several collectors arranged in series. Fittings are provided on each collector for series connection (see Fig. 3).

If more than six glazed flat plate collectors are required, the extra collector can be installed (if the pressure drop allows) in series with the others utilising an expansion piece between the 6th and 7th collectors.

The collectors can be installed in series, in parallel or most commonly a set of panels in series set out in parallel circuit. The decision to decide whether the panels are to be fitted in parallel will depend upon pressure drop, performance and location. Which ever type is chosen consideration must be given to the location of the temperature sensor (see Fig 3.).

PRESSURE DROP

The amount of collectors in series is limited by the potential pressure drop (see technical section) and thermal expansion within the collector headers.

Simply introducing a parallel circuit into a system could reduce the pressure drop through the collectors significantly.

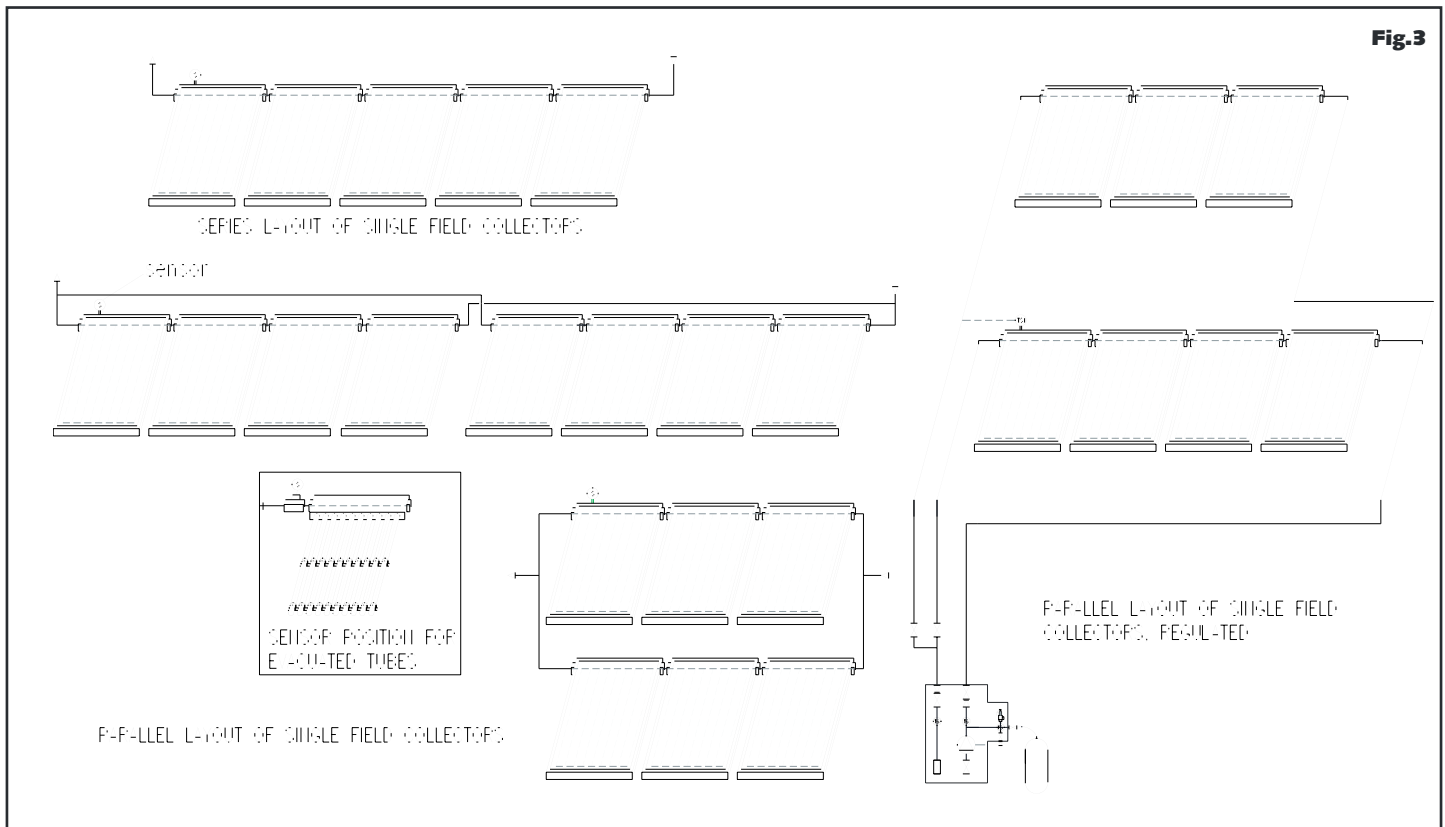
Refer to the pressure drop curve in the technical specification.

GENERAL

COLLECTORS IN SERIES/PARALLEL

PERFORMANCE and LOCATION.

The collectors could be split into fields (see basic operation) due to performance, site location or both. If separate fields are required these can be arranged into either series or parallel configurations.

COLLECTOR LAYOUTS

If collectors are installed in parallel either in the same field, or due to location separate fields, the flow balancing should be addressed. It is recommended that if pipe runs are such that the resistance through each circuit could lead to unbalanced flow, some form of flow regulation device should be installed on the return lines of each leg.

Due to the need for limiting the requirement for roof access, it is recommended that the flow regulator devices are located in the plant roof or an easily accesable area. This will mean that long pipe runs are required on the return lines before the pipes reconnect. (see Fig 3). Flow regulation should only be required when the pipe (see page 12) runs between the collector fields for panels local to each other there should be no need for regulation. For collectors local to each other there should be no need for regulation. The collectors are capable of withstanding small variations in flow.

**SENSORS IN
PANELS**

A PT1000 temperature sensor is used to determine whether there is enough solar energy from the collectors. This sensor measures the temperature of the collector absorber or, in the case of evacuated tube collectors, the water leaving the collector array, to check there is sufficient heat gain.

The two different collectors (glazed flat plate or evacuated tubes) require different sensor type and location.

See Fig 3 for collector layout.

Glazed Flat Plate Collectors:

With this type of collector the sensor is actually located in the collector (not in the liquid). The sensor is simply placed in a pocket which is connected to the rear of the collector absorber to measure the temperature.

The temperature sensor is placed on the flow line exiting the collector array.

Location for Series/Parallel (single field) Layout, Fig 3.

As mentioned in the description a single field collector array can be arranged in parallel to reduce the pressure drop and limit expansion within the collector header. Fields are designed to optimise system performance. Please refer to basic operation for details or contact Andrews Water Heaters.

The operation of the system will determine the sensor location.

IN SERIES – the sensors are placed in the final collector

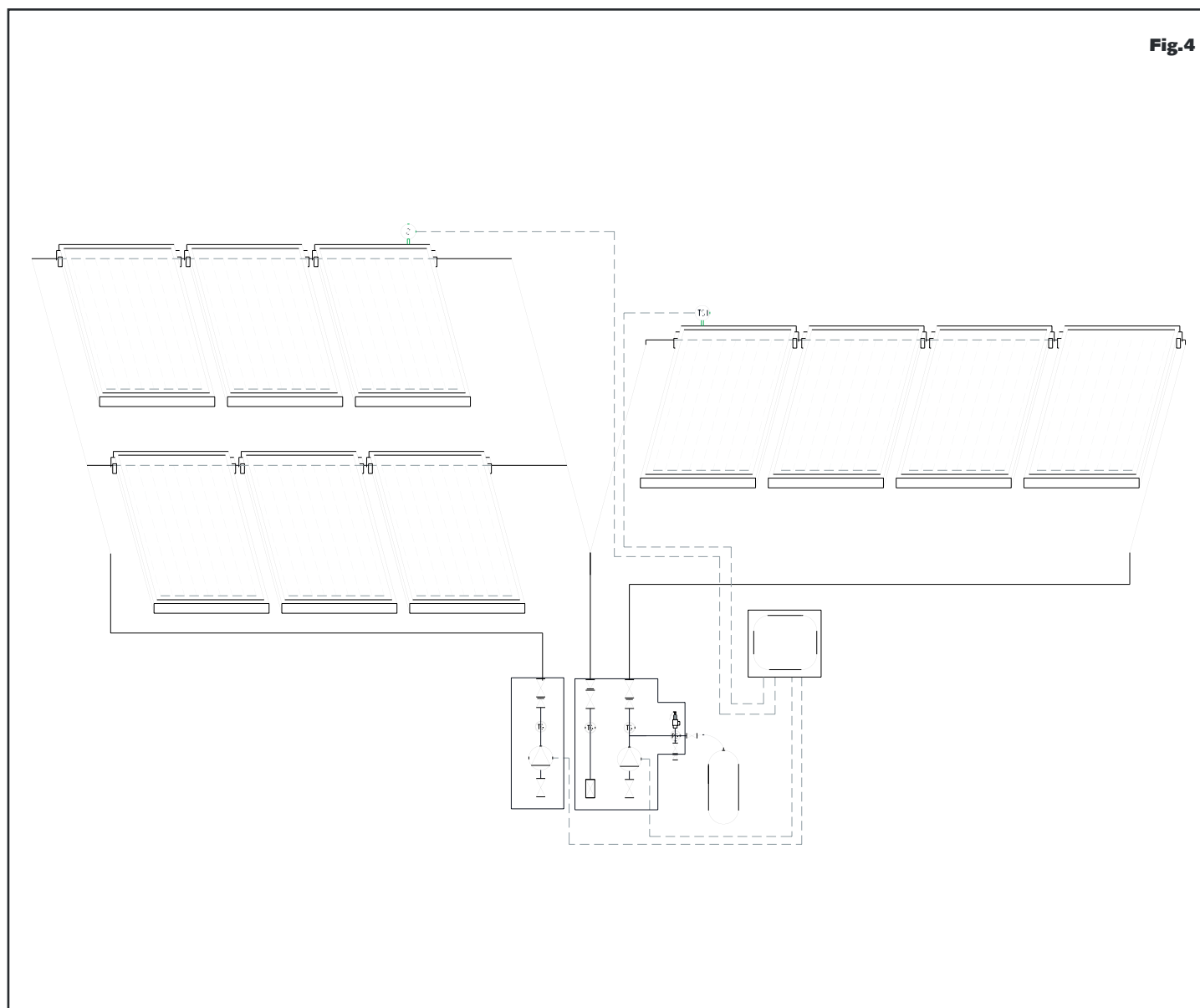
IN PARALLEL – the sensor should be placed in the collector closest to the return.

MULTIPLE FIELDS

If the individual solar fields are exposed to different levels of solar irradiation due to roof angle, orientation, location or shading, separate sensors should be used for each field. The fields should then be treated separately and wired back in to the controller.

The sensor should be placed on the return leg from each field, and one sensor per field.

SCHEMATICS OF COLLECTOR sensor location in multiple fields (fig 4).

**Fig.4**

When two or more fields are used with potentially different solar irradiation exposure, a pump is required for each field as well as separate sensor. The standard SOLARflo control unit system can manage two solar fields.

It is possible to control two solar fields with two sensors and one pump, but this would require the introduction of a switching valve.

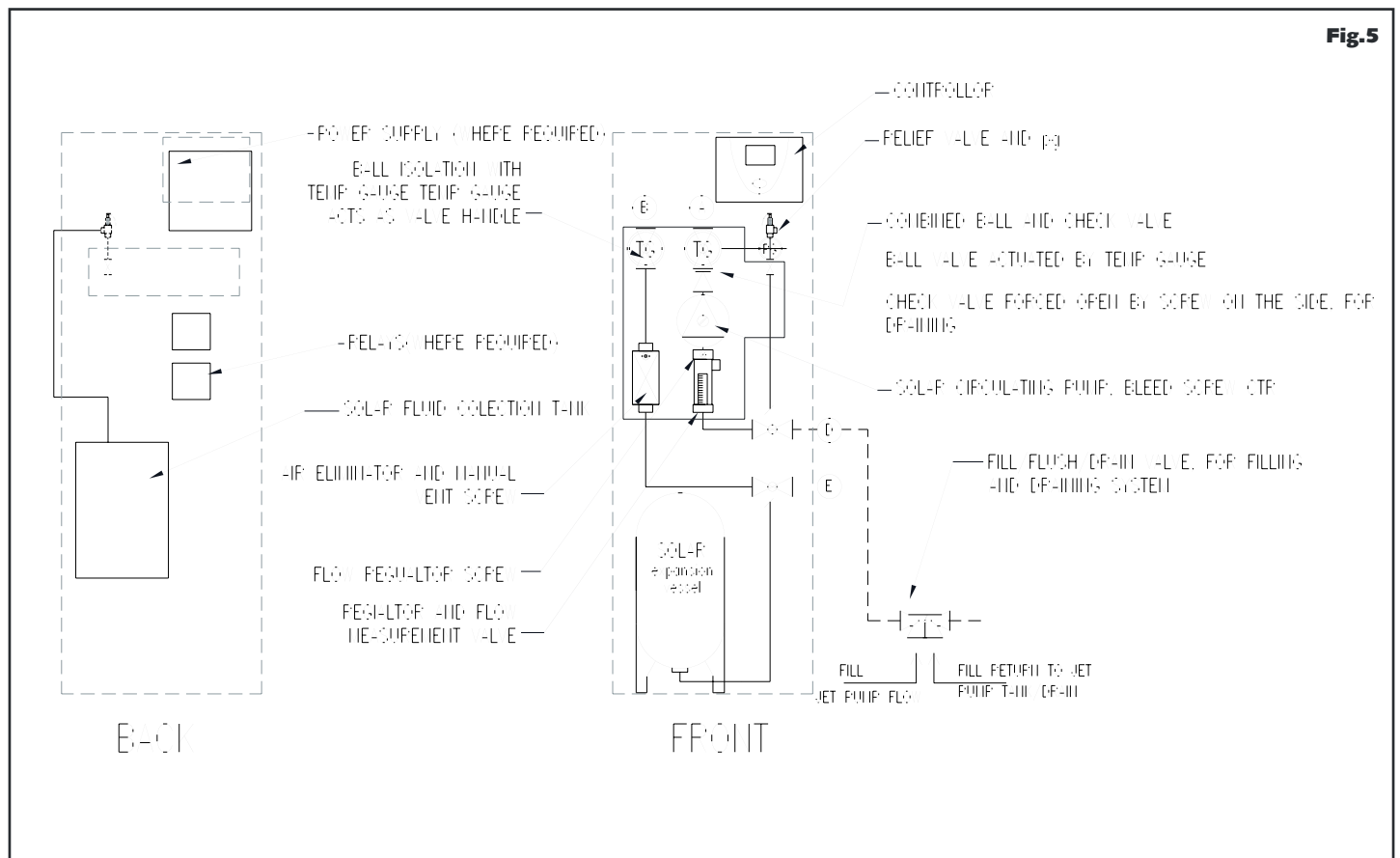
SOLAR STATION

Comprising:

Pumping Station, Expansion Kit, Pipe-Work Ancillaries.

The three main items are generally factory fitted by Andrews Water Heaters onto a frame to form the 'Solar Station'. If the equipment is supplied loose please refer to the installation instructions for the individual components.

This 'Solar Station' will require floor mounting and must not be wall hung. Due to possible location of a voltage relay and collection tub access at the back of the frame is required. Therefore the Solar Station must not be fitted up against a wall.



The 'Solar Station' requires a recommended distance of 500mm clearance to allow for maintenance. It is essential that the correct pipe-work connections are followed for the individual components.

NOTE: However the 'Solar Station' is supplied, it is important that the pipe-work is fitted so that all the pump and ancillary equipment is connected on the return to the collectors. This is to limit the temperature of the heat transfer fluid that the equipment is exposed to.

CONNECTIONS:

FLOW: See Diagram Above

Flow to Collectors

Return from Collectors

-A Flow to Solar Coil in Cylinder. -C

-B Return from Solar Coil in Cylinder -D

Relief Valve: To be piped back to the fill tub. On the 'Solar Station' this can be hung from the back of the frame. There should be no restrictions or isolating valves in the discharge line. This is recommended to prevent loss of the solar heat transfer fluid.

**ANCILLARY
EQUIPMENT****Fill Flush Drain Valve:**

A fill, flush and drain valve is fitted. The valve is used to initially fill the system by Andrews Water Heaters. As this valve is to be used for draining as well as for filling it is recommended that this is installed in the lowest part of the solar circuit. Flexible connections are recommended to attach to drain. This will allow easy connection and reconnection of the drain after filling.

AIR ELIMINATOR (optional)**EXPANSION:**

The expansion vessel will be pre-fitted and piped on the solar station. The vessel will have been sized for the initial specification of the system, taking into consideration pipework runs. If the solar volume has been increased for any reason or more importantly if extra collectors are added or changed for different types, the expansion vessel size may have to be changed. Under such circumstances please contact Andrews Water Heaters for advice.

If the unit is not pre-fitted it is important that either the vessel is installed upside down where possible, or lower than the solar circuit. This helps prevent the potentially high temperature heat transfer fluid reaching the vessel.

NOTE: A correctly sized expansion system should always be fitted to the solar circuit. This expansion system should be sized for temperatures and expansion associated with a solar system.

WIRING AND PANEL

GENERAL:

All solar system control is managed by the main 'Solar Station'. This includes all power wiring. The main controller and any ancillary electrical items will be located on the 'Solar Station'.

There are many variations of systems for control e.g. multiple collector and cylinder sensors and pumps including variation of systems for primary heating control. The individual technical specification will provide the information for the specific system for your application. Which ever system is supplied it will be selected and set on the 'Solar Station' via the controller.

All sensors and powered electrical equipment are wired directly into the main terminal rail. Where high power items are required (e.g. large pumps and immersion heaters) or equipment switching separate relays, these will be supplied pre-fitted on the 'Solar Station' possibly with a power contactor box.

The pump will always be pre-wired on the 'Solar Station'. If relays and contactor boxes are required, all connections on the 'Solar Station' will be pre-wired (see Fig 6).

The following instructions will be based on the simplest systems ie. single cylinder, single collector field, single pump with reference to other types. It also shows an example with relay contact for primary heating control and with an electric immersion heater complete with separate power supply to demonstrate the relay boxes.

RELAY BOXES:

All outputs from the controller are 230V 50Hz, with limited current.

When the output does not require 230V eg. volt free contacts, a relay box is used to enable the 230V output to open and close a connection.

When the output power is too high for the controller a relay is again used but this time with a second protected power supply. The controller will switch the relay to allow the required device to be powered from the secondary supply.

Please refer to the schematic layouts of the 'Solar Station' for indication of wiring requirements

WARNING:

**ALL APPLIANCES MAY BE OPENED ONLY
WHEN MAINS VOLTAGE HAS BEEN SAFELY CUT
OFF AND IS PROTECTED FROM RESTARTING.**

Solar Station electrical layout for Standard Installations:

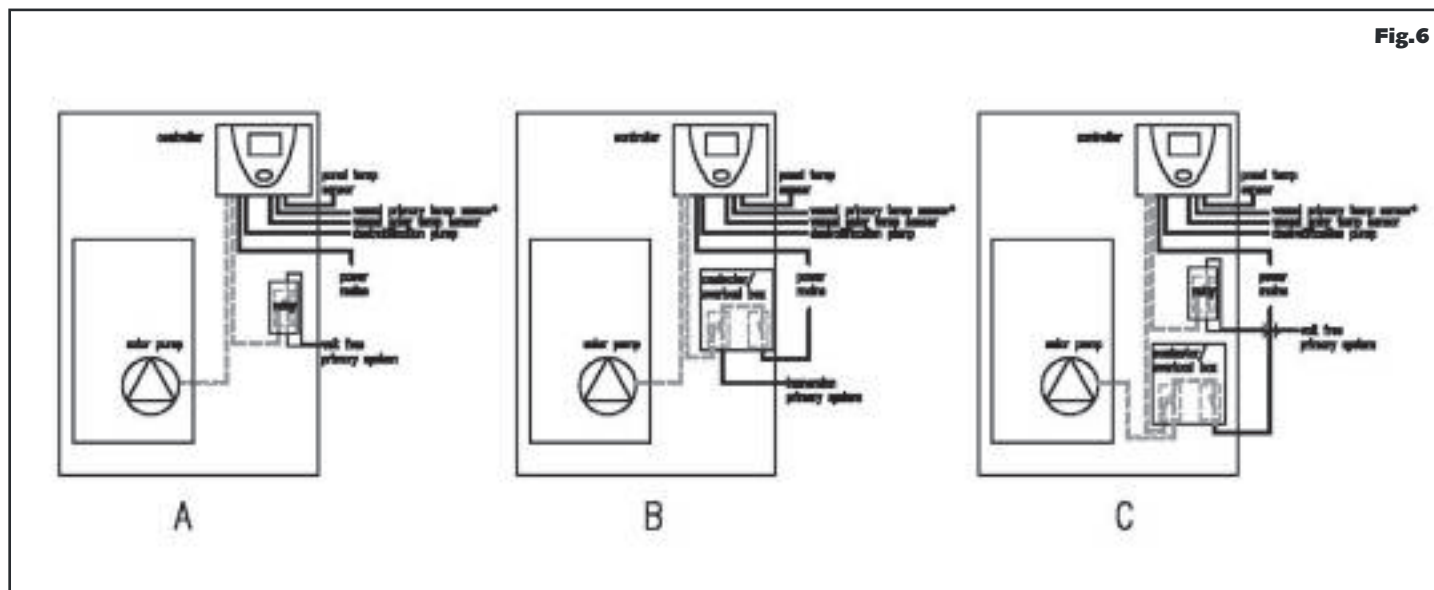


Fig.6

*primary temperature sensor will generally only be used in combined (twin-coil) cylinders. In a pre-heat system with the MAXXflo or other direct-fired water heater. The temperature control is carried out within the heater and therefore primary heater control is not required.

It is recommended that the power to the controller is easily isolated locally either by plug switch or switch local to the 'Solar Station'. This is due to the fact that certain maintenance settings can only be assessed by switching the unit on and off.

A – Standard Layout. The primary output 230V is connected to a relay so that a volt free signal can be picked up by a primary control system.

Example: Where the primary heating coil is connected to the heating system boiler, the controller requires a hot water demand signal. This would then switch the system to water heating mode or divert flow to the primary coil.

Where the primary system consists of a pump or valve the 230V can be wired directly to the control unit without the relay. If this is not supplied by Andrews Water Heaters, it should be checked to ensure it is suitable for the operation.

B – This is where the primary top up is heated by an electric immersion heater controlled by the solar controller. The 230V has to be used to switch a contactor to allow power to the immersion heater. Andrews Water Heaters will supply a pre-fitted wired contactor/overload panel rated for the immersion heater.

Two power wiring connections are required, one for the controller and one for the electric immersion heater power supply. Please see technical sheet for power supply requirements.

The output can be used for any equipment where large power supplies are required.

C – This uses the same principle as B, except the controller powers the solar pump where large pumping capacities are required.

NOTE: when a contactor is required for powering the pump, the variable speed option is not possible.

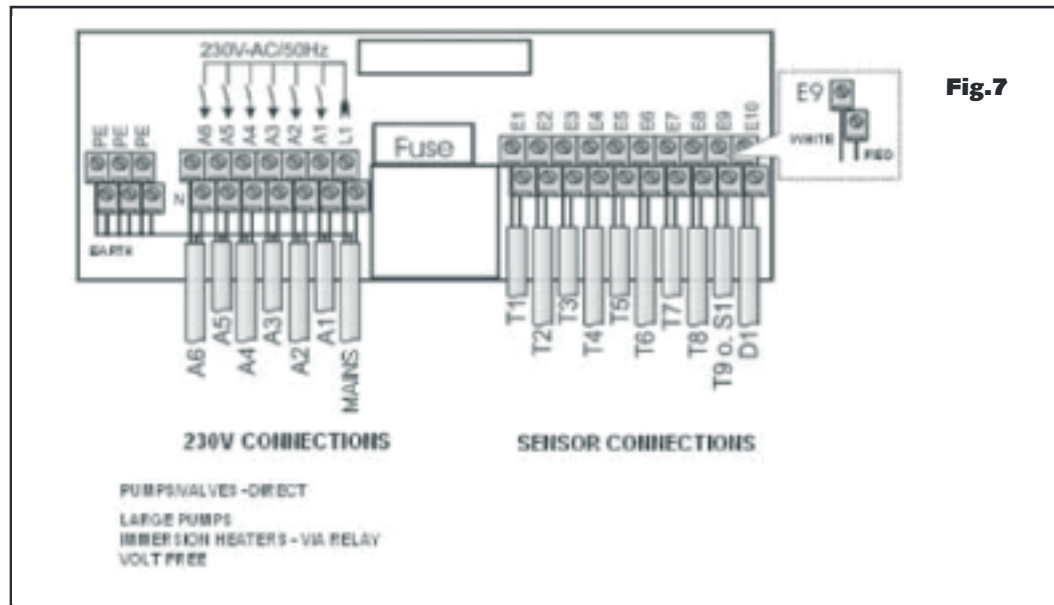
The above principles can be applied to all the systems.

Wiring is straight forward as operation of the SOLARflo system is setup within the controller. All the individual equipment needs wiring back into the controller. If there are multiple solar fields, and/or multiple cylinders, extra sensors will need to be wired back to the controller (see Fig 7).

MULTI SYSTEMS

If any outputs require volt free contacts or high loads please refer to the simple connections above. A 'Solar Station' can have more than one contactor/relay.

THE CONTROLLER:



CONNECTIONS:

MAINS: Power Supply to Controller (230V 50Hz 4Amps)

If a contactor is supplied this will be pre-wired. A power supply should be connected into the contactor.

OUTPUTS: A1-A6 are all 230V power outlets.

Outputs for standard systems – See controller instructions for other systems

A1: Solar Pump Power Supply This will be pre-wired.

A2-A4 outputs dependant on type of system and if multiple pumps are required

A5: Primary Heat Demand Output Wired on site if required (can be used for other control)

A6: Destratification Pump. Wired on site.

Temperature Sensors:

T1: Collector Sensor: This will be wired using the wire fitted in the flexible pipe-work (if supplied).

T2: Cylinder Solar Sensor.

T3-T5: Sensors for multiple vessels or sensors.

T6: Energy Measurement sensor if required (can only be used in conjunction with an irradiation sensor)

T7: Primary Heated DHW sensor (Top sensor within twin coil cylinder or temperature sensor in a second cylinder)

T8: Spare sensor for operation of other systems.

S1: Solar sensor, used for system start if T1 used for energy measurement.

D1: Flow meter for energy measurement. Uses T1 and T6

Please refer to the specification sheet for connections supplied for your specific controller and wiring diagrams.

All connections should be made using appropriately sized wire.

(15M = 0.50mm², >15M = 0.75mm²)

The temperature sensors used for this controller are PT1000

Please note for standard systems separate wiring diagrams are not supplied.

Termination cable at sensors, pumps and other devices.

Sensors in solar fields and cylinders:

Temperature sensor for collectors (one per solar field) are located as per the previous section on sensor location in collectors.

If stainless flexible pipe-work is used, the cable for the sensor is included within the pipe-work. A termination box will have to be installed close to the collectors if a pre-wired sensor is used.

Temperature sensor from storage cylinder solar section, (one per cylinder) are located in the solar section of the vessels.

The destratification pump is located on the solar cylinder.

TEMPERATURE SENSORS:

The standard sensor supplied by Andrews Water Heaters is a glanded PT1000 sensor, complete with terminal space box for ease of installation.

For glazed flat plate collectors a PT1000 without fitted terminal box is supplied for placing in the collector sensor position. This can then be wired to a suitable terminal box, for connection back to the controller.

Mechanical:

The gland on the temperature sensor is adjustable so the immersion length can be altered to suit location and pipe-work.

The gland has a screwed BSP male connection. This can be utilised with bushes to fit into any size of connection. (These are supplied by Andrews Water Heaters, for cylinder the connectors).

Electrical:

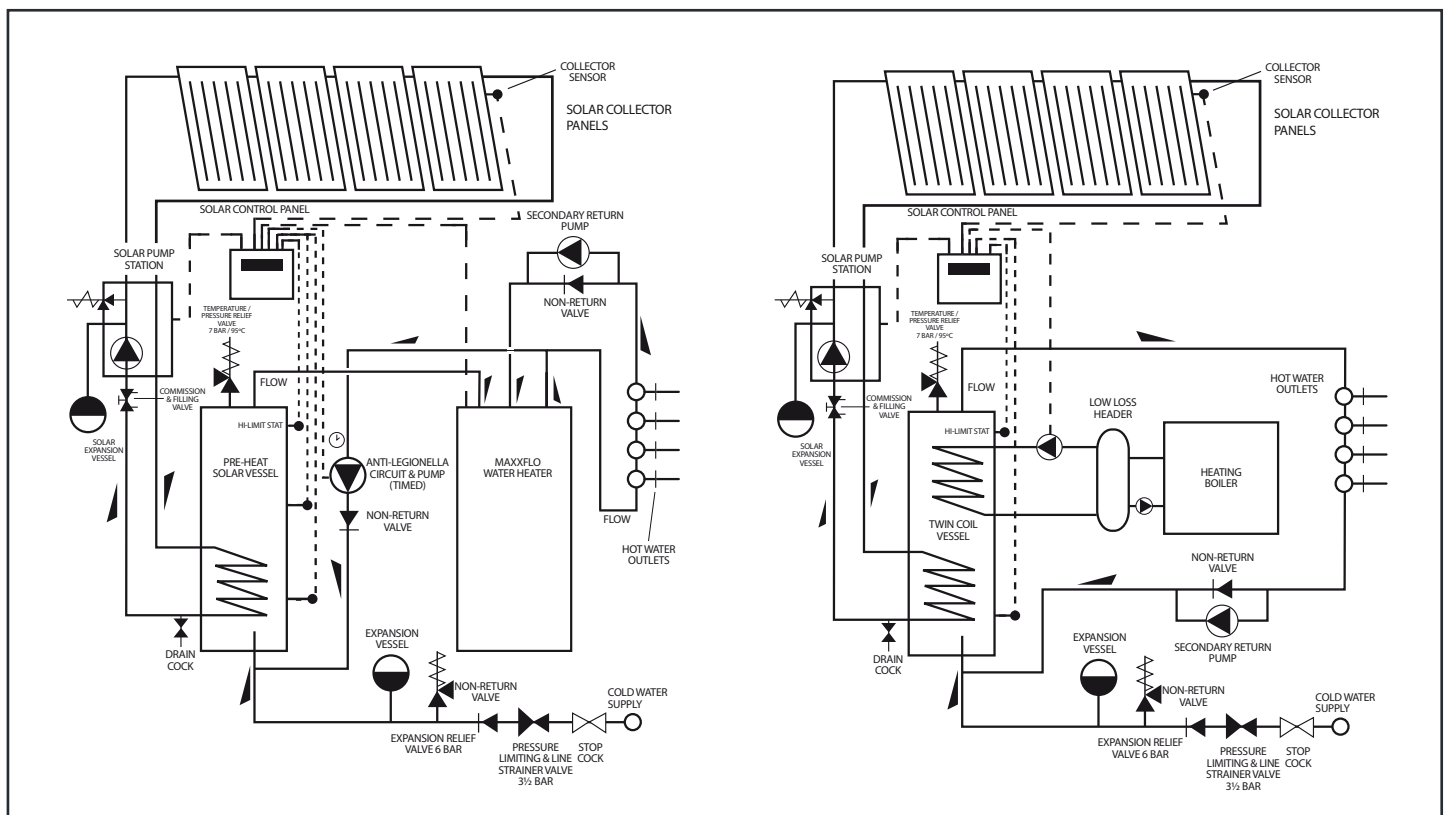
Please refer to the enclosed manual to ensure correct wiring.

DHW SIDE

DHW Vessel, expansion and cold feed kit.

The individual instructions should be read through thoroughly before installing. If there is any doubt, please ask Andrews Water Heaters. Installation should only be carried out by competent persons. Standard system supplied are unvented, therefore the system should only be installed and commissioned by qualified persons as per Building Regulations.

PLEASE NOTE: The installation of the DHW system should be carried out as a standard DHW system following all regulations in the Building Regulations G3 and water regulations. Consideration should be given to Legionella using L8 for guidance. This section is not a comprehensive guide to DHW installation all supplied equipment Installation instructions should be read fully and the above regulations adhered to.



Dependant on the scope of supply the cold feed and expansion system will be supplied with either the solar cylinder or the direct-fired water heater.

On all combined systems both expansion and cold feed equipment will be supplied with the solar cylinder.

Please refer to the technical appendix and specification sheet to determine the unit supplied.

DE-STRATIFICATION:**COMBINED VESSELS**

The Destratification pump is supplied fully fitted, only wiring is required

PRE HEAT VESSELS.

The Destratification pump is supplied fitted

SENSORS

PRE-HEAT VESSELS: The solar sensor (T2) can be located at higher level when a pre-heat is used.

The Primary heating sensor is located in a second vessel if supplied.

If the unit is supplied with the MAXXflo unit there is no requirement for primary heating sensor as control is carried out by the MAXXflo.

See Fig 8 for location.

COMBINED TWIN: The sensor (T2) is located in the lower section with the solar coil. The primary heating sensor is located at higher level. (refer to controller instructions for connection maker).

See Fig 8 for location.

COLD FEED:

It is essential that any cold feed line to the system complies with the relevant water regulations.

The cold feed equipment supplied is designed for the flow rate of the equipment supplied. This should not be used to feed any other systems.

PREHEAT TWIN VESSEL SYSTEMS: preheat and topup

The vessels need to be connected together with appropriate sized pipe-work (see cold feed) the vessel installed as per installation instructions.

Connections must leave top of the pre-heat vessel and enter the bottom of the 'Top UP' vessel

PREHEAT MAXXflo SYSTEMS:

As above. Connections however leave top of the pre-heat vessel and enter the cold feed in connection in the MAXXflo.

All systems must ensure that the DHW final temperature is achieved. all though many systems are available the installation instructions will only cover the three standard systems.

DHW TOP UP AND PRIMARY

TOP UP SYSTEM:

1. COMBINED: This refers to twin-coil and possibly single coil pre-heat cylinders fitted with electric immersion heaters.

2. PRE HEAT with MAXXflo

See Fig 8 for connections.

The MAXXflo once connected to the solar cylinder will require installation as per the seperate MAXXflo instructions supplied. No primary sensor connection is required on the solar cylinder.

3. PRE HEAT with TOP UP Cylinder

See Fig 8 for connections.

The second cylinder will behave as a standard calorifier.

If temperature control of this unit is to be carried out by the solar controller, a temperaure sensor (supplied) will have to be fitted and wired back to the controller.

PRIMARY The following assumes top-up temperature control is managed out by the solar controller.

Control Valve:

A control valve (2/3 way) is required to be fitted in the feed line from the primary heating system.

This has to be sized for flow and pressure drop.

The control from the 'Solar Station' can only be used for on/off functions.

The voltage must be 230V and the maximum current must not exceed the output from the 'Solar Controller'.

Enable Output:

This is connected via a relay. Full primary heater control would then be managed by a separate system

This enable output is used by Andrews Water Heaters if a boiler is supplied as part of the SOLARflo package.

Primary Pump:

This is the same as the controller and voltage and currents have to be checked.

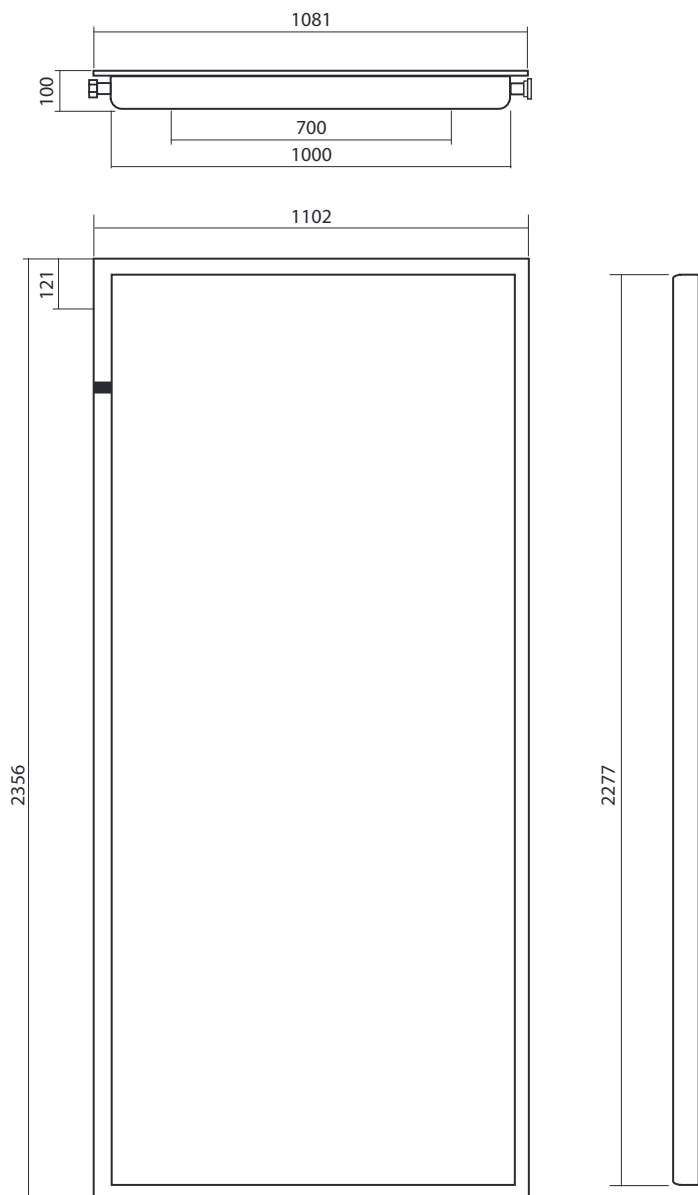
Full Boiler System:

See above. Please refer to technical details of boilers supplied and connection details.

REF	CIRCUIT	EQUIPMENT	VARIATION	AVAILABLE	SELECTION BASIS
1	SOLAR	The solar collectors	TYPE	Glazed Flat Panel Collector	Based on required performance of system and suitable location.
			QUANTITY		Based on DHW demands, location and Type of Collector.
2	SOLAR	A controller to control the solar gain and integrate the 'top up' heating.	NONE	N/A	Only one controller is used throughout the range.
3	SOLAR	Solar pumping system	NONE	N/A	Only one pumping station is used throughout the standard range.
4	SOLAR	Solar pipe-work	TYPE	Stainless Steel Corrugated or Copper	Depends on ease of installation requirements and pressure drop. Copper will offer lower pressure drops for a dimension but is more difficult to install.
			SIZE	SS-DN20,25,32 Copper 22 and 28mm	Depends on flow rate and pressure drop.
		Expansion vessels	QUANTITY	Meters	Depends on distance of runs.
			SIZE	50,80 ltr	Depends mainly on type and quantity of collectors and system size.
		Filling and flushing device Air scoop and vent	NONE	N/A	
			NONE	OPTIONAL	
5	DHW	The DHW storage cylinders	TYPE	COIL SINGLE PRE-HEAT TWIN-COIL	Based on operation of the system See Operation
			VOLUME+ QUANTITY	450,550,700,900 ltrs	Total storage volume will depend on demand and solar collector area and type. Multiple cylinders can be used to increase volume and/or for separate DHW loads.
6	DHW	DHW expansion system. Vessels, expansion relief valve	SIZE+ QUANTITY	N/A	Size and quantity combine to produce the right size expansion system for the secondary volume. This is mainly determined by DHW cylinder size/volume.
7	DHW	De-stratification/anti-legionella pumping system	TYPE	SINGLE COIL PRE-HEAT OR TWIN-COIL (COMBINED)	Both pumps are identical. The pump for the twin-coil solution is pre-fitted to the cylinder. The pump for the single coil pre-heat cylinder requires the return line fitting to the outlet of the direct-fired water heater.
8	DHW	Cold feed equipment	SIZE	1", 1½"	Sized for maximum flow rate of DHW system, this is usually sized to cylinder volume and/or duty.
9A	PRIMARY	Primary heating control supply	TYPE PRE-HEAT To feed top-up system	MAXXflo gas fired water heater	Combined top up and primary system
				Control Valve	Opens control valve to allow primary flow to top up system
				Enable Output	Gives signal output to another control system
				Primary Pump	Switch pump to divert flow to 'top up' system
				Full Boiler System	Complete boiler system for primary hot water supply
			TYPE COMBINED (TWIN-COIL) To feed top coil	Immersion Heater	Output to immersion for top up heating
				Control Valve Enable Output Primary Pump Full Boiler System Immersion Heater	See above
					As back up only with separate control
9B	TOP UP PRE-HEAT ONLY	System to heat DHW to final temperature Utilising heat supplied by the primary system	TYPE	MAXXflo	Combined primary and top up system
				Second cylinder with coil Immersion Heater Instantaneous Plate Heat Exchanger NONE	Used with primary system above Used with immersion heater above

**INFORMATION
ABOUT THE
COLLECTOR**
Technical data

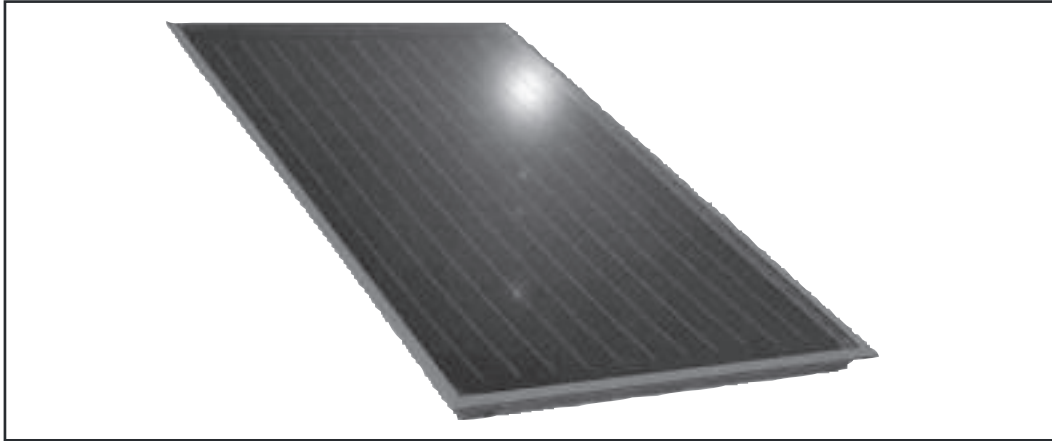
Gross Area	m ²	2.55	Weight (dry)	kg	48
Net Area	m ²	2.21	Contents	l	1.5
Aperture	m ²	2.29	Max. Pressure	bar	10


TECHNICAL DATA

Absorber coating:	high sensitive vacuum coating
Light transmission efficiency:	90.8% $\pm$ 2%
Absorption efficiency:	95.0 % $\pm$ 2%
Emissions:	5.0 % $\pm$ 2%
Stagnation temperature:	180°C plus temperature ambient
Max. operating pressure:	10 bar
Design approval No.:	T _v 02 - 328 - 083
Heat transfer medium:	Polypropylene glycol / water mixture

The collectors of this series are dry sealed without silicone. The solar glass cover is sealed by means of an uncemented rubber frame. The full-face absorber is bedded in an aluminium trough on a layer of rockwool with a thickness of 50mm. A special modular mounting system was developed for the series which makes it possible to realise stand-alone (A-frame mounted) and roof mounted solutions with equal ease.

FK 7300 GLAZED FLAT PLATE COLLECTOR



2.1 Housing

Aluminium trough with protection foil

Material: Aluminium – AlMg3

Colour: Aluminium

Thickness: 0.8 mm

2.2 Absorber

Full-face absorber; headers and manifolds are hard soldered and ultrasonically welded to the absorber sheet

Header tubes: Ø18x1.0 mm; 22x0.8 mm

Manifolds: Ø8x0.5 mm

Copper sheet: High selective vacuum coated 0.2 mm

Connections: Flat-sealing DM 22-1"; DM 18 3/4" screw couplings

2.3 Transparent Cover

4mm low-iron solar glass, tempered

Light transmittance of glass: > 90.8 +/- 2%

Collector dimensions LxW (mm): 2318 x 1044

Sealing of glass: Continuously vulcanized (UV-proofed EPDM - rubber frame - shore 70)

2.4 Insulation

40/50mm mineral wool

Heat conductivity: 0.045 W/mK

Gross density: 50 - 80kg/m³

2.5 Other

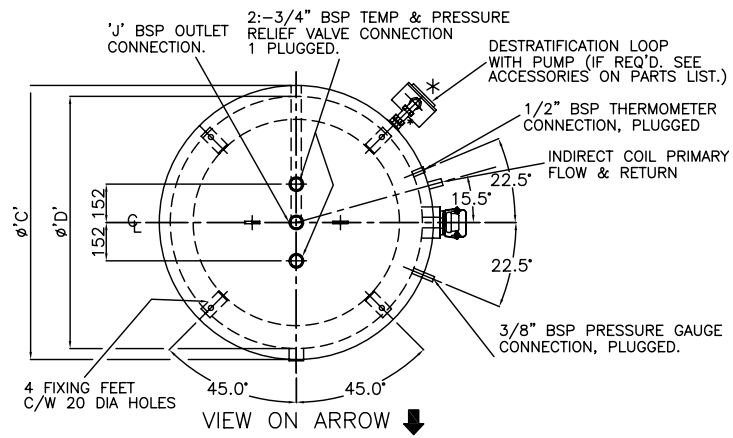
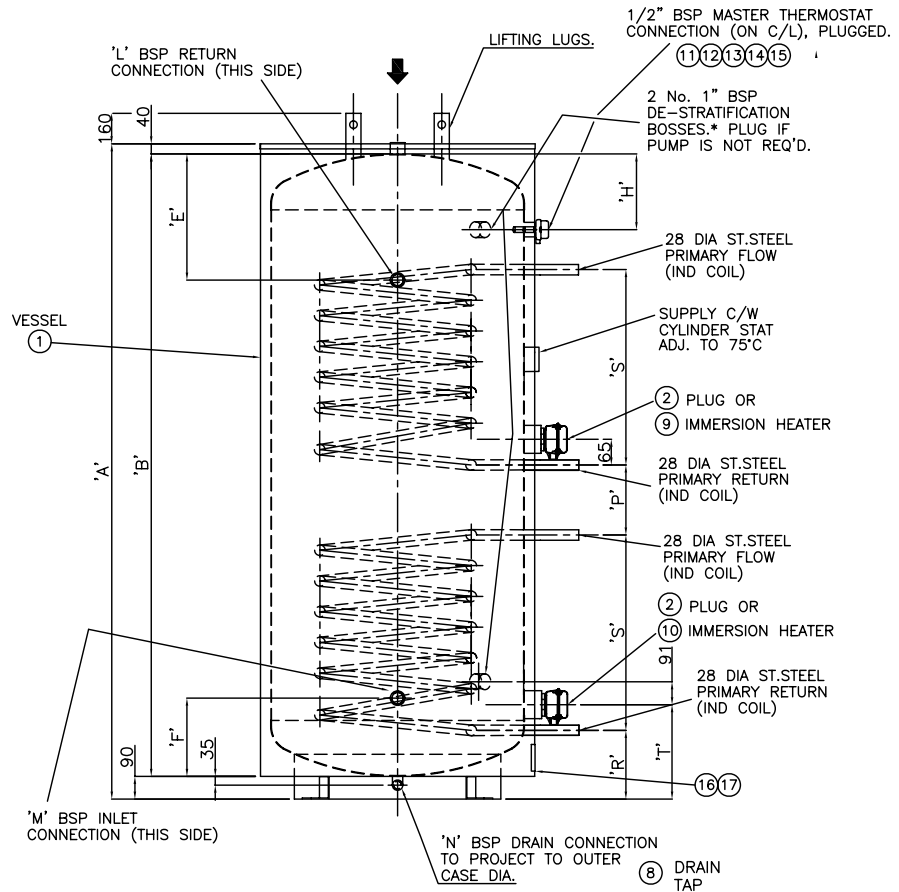
Fixing of outlets: Fixings of manifolds are made from fibre reinforced plastic and form a thermic separation to the trough.

Type plate: UV-proof and weather resistant silver polyester – sticker

Packing: According to our customer's demands Andrews Water Heaters can wrap individual collectors or deliver on pallets.

TECHNICAL DESCRIPTION OF THE COMPONENTS

SCHEDULE OF SERIES 2000 VERTICAL WATER HEATERS GENERAL ASSEMBLY

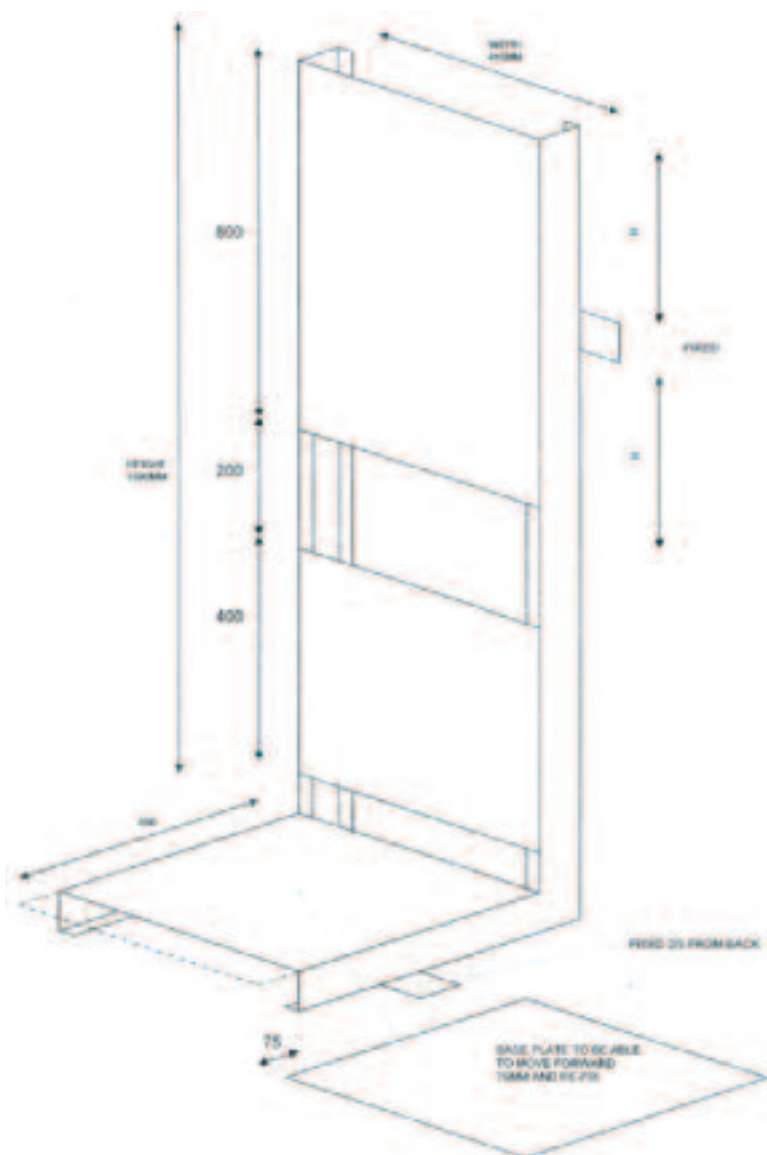


- | | |
|-----------------------------|---|
| (3) EXPANSION VESSEL | (6) TEMP&PRESS. RELIEF VALVE
(1 OFF FITTED UP TO 27kw,
2 OFF FITTED UP TO 54kw) |
| (4) SINGLE CHECK VALVE | (7) PRESSURE RELIEF VALVE. |
| (5) PRESSURE REDUCING VALVE | |

FOR OPTIONAL EXTRAS - THERMOMETER, PRESSURE GAUGE & VALVE, DE-STRAT LOOP & PUMP - SEE WORKS ORDER.

**TABLE OF
DIMENSIONS**

CAPACITY LITRES	A	B	C	D	E	F	G	H	J	L	M	N	P	R	S	T	PARTS LIST WH-610-___
450	1805	1675	685	600	500	210		300	1"	1"	1"	1"	150	199	540 650	264	A1=
550	2160	2030	685	600	500	210		300	1"	1"	1"	1"	150	199	650	264	B1=
700	2690	2560	685	600	500	210		300	1"	1"	1"	1"	150	199	650	264	C1=
900	1702	1572	986	900	500	285	425	300	1 1/2"	1 1/2"	1 1/2"	1"	50	276	540	341	D1=

**SOLAR STATION
FRAME**

STANDARD EQUIPMENT

	6		1	2	3	4			
	VE	SSEL	COLLECTORS	CONTROLLER	SOLAR PUMP	SOLAR EXP	FILL & FLUSH	PIPE-WORK	AIR SCOOP
SYSTEM	PRE-HEAT	COMBINED	PANEL FK700N	M	ODEL	SOL-EXP	MODEL	SIZE/TYPE	MODEL OPTIONAL
	MO DEL	MODEL	QT Y	MODEL	L 130 (S128)	SIZE	FFD (S130)	SIZED FOR FLOW AND PRESSURE DROP	AS (S108 + S109 + S110)
450	S111	S115	4 (S100)	GENIUS+ (S131)		50 (S133)			
550	S112	S116	5 (S100)	GENIUS+ (S131)		50 (S133)			
700	S113	S117	6 (S100)	GENIUS+ (S131)		80 (S134)			
900	S114	S118	4+3 (S100)	GENIUS+ (S131)		80 (S134)			

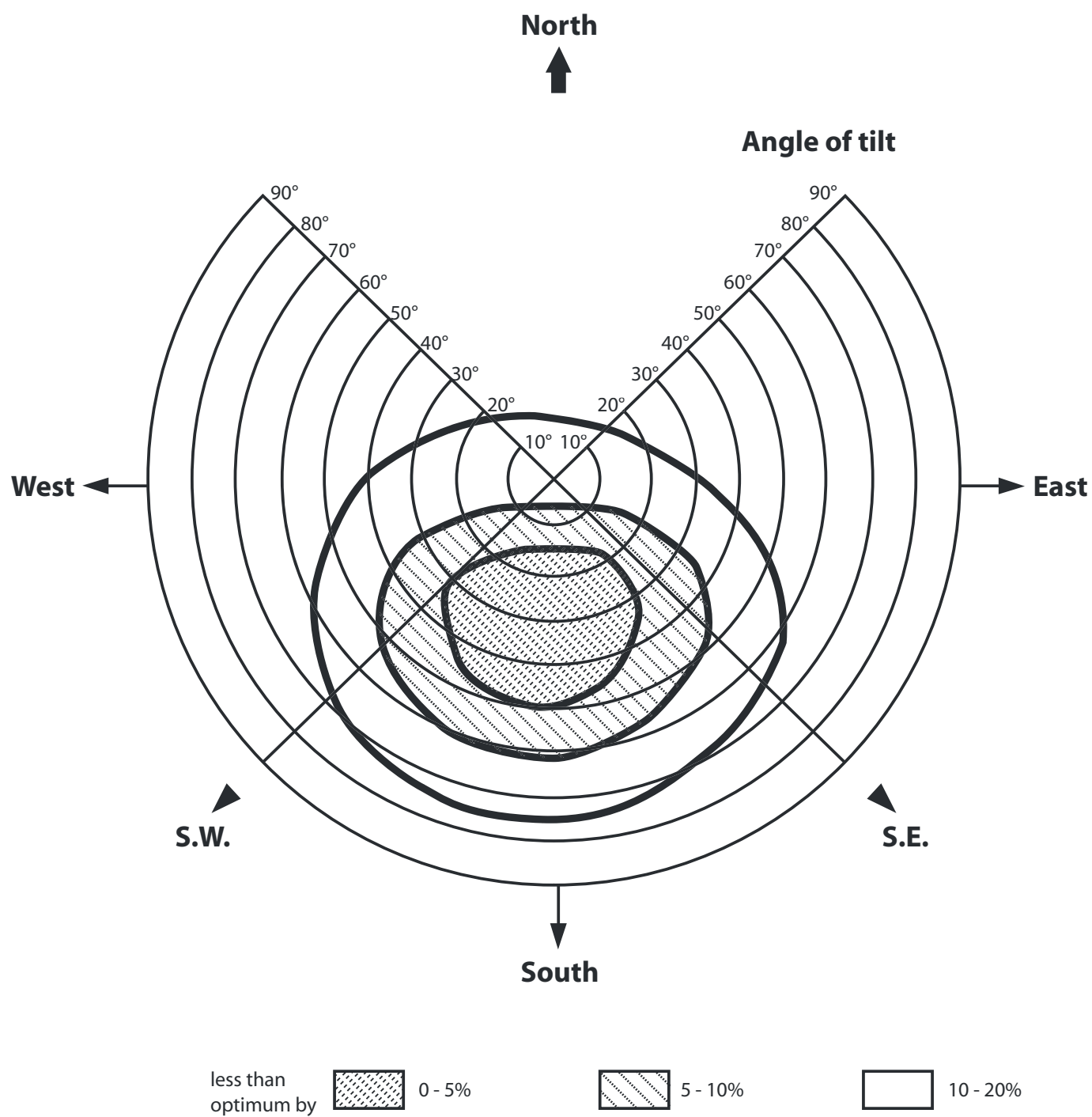
	6		8		7		9B		
	DHW-EXP. VESSEL		COLD FEED		DE-STRAT		TOP UP		
							PRE-HEAT		COMBINED
SYSTEM	COMBINED	PRE-HEAT	WITHOUT MAXXflo	WITH MAXXflo*	COMBINED	PRE-HEAT	MAXXflo	CAL ORIFIER	PRIMARY SYSTEM
	SIZE	SIZE**	SIZE	SIZE	MODEL	MODEL	MODEL	MODEL ***	MODEL
450	40	DEPENDENT	1"	1"	DESTRAT	SHUNT	DEPENDANT	S111	REFER TO
550	40	ON	1"	1"	PUMP SET	PUMP	ON	S112	POTTERTON
700	60	APPLICATION	1"	1"	(S122)	SET	APPLICATION	S113	COMMERCIAL
900	80		1 1/2"	1"		(S121)		S114	0845 070 1057

* For preheat systems an extra 'top up' system is required which may require extra expansion requirement.

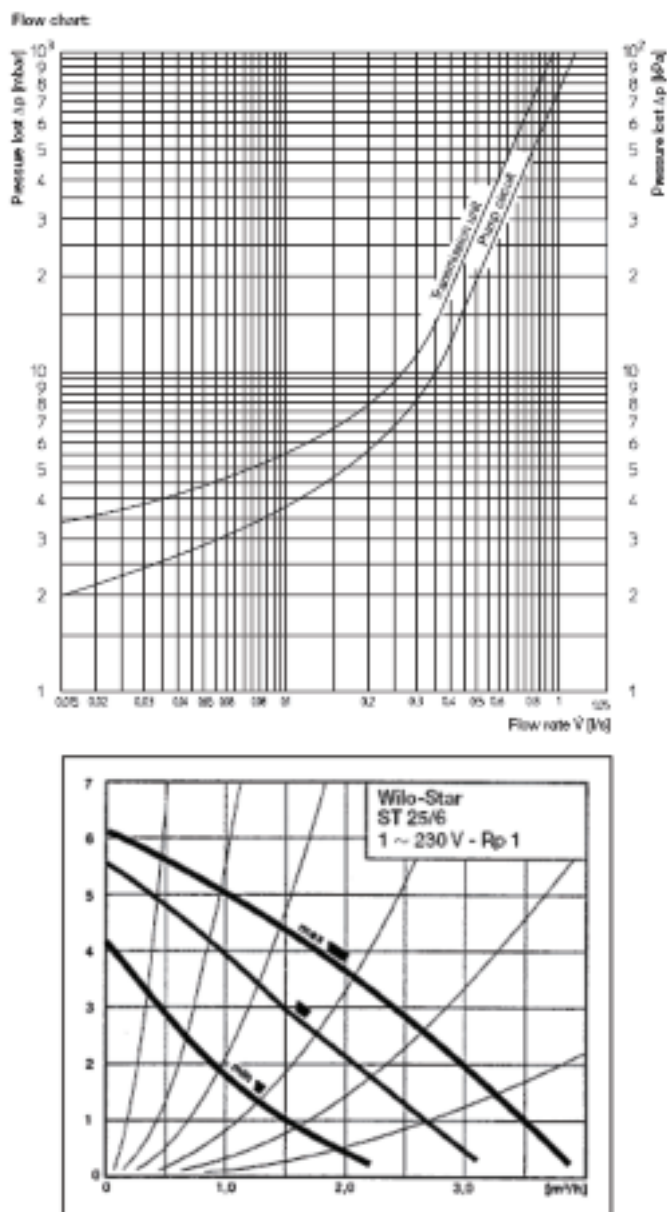
** Cold feed equipment supplied with the MAXXflo is designed for capacity of the MAXXflo

*** Other top-up systems are available. All system apart from MAXXflo will require some form of primary system.

**SOLAR
IRRADIATION
LOSSES FOR ROOF
ORIENTATION AND
ROOF ANGLE**



PUMP CURVE



SOLARflo SYSTEM CONFIGURATION MATRIX

	Water Storage Capacity (Litres)	No Hot Water Cylinders	No of Solar Collectors	No of Collectors in Series	No of Parallel Circuits	Total Collector Area (m ²)	STAINLESS CORRUGATED		COPPER PIPEWORK	
							Solar Pipework Diameter (mm)	Total Pipework Length (M)	Solar Pipework Diameter (mm)	Total Pipework Length (M)
SOLARflo 450	450	1	4	4	1	10.2	DN20	80	22	100
SOLARflo 550	550	1	5	5	1	12.75	DN20	70	22	90
SOLARflo 700	700	1	6	6	1	15.3	DN25	60	22	60
SOLARflo 900	900	1	7	4 + 3	2	17.85	DN25	80	28	100

Notes

1. The total pipework length includes the flow and return pipework between the cylinder and the solar collector array
2. The pipework lengths are the equivalent lengths including all bends
3. If any of the parameters are outside those specified in the above table reference to should be made to the Technical Support Department at Andrews Water Heaters for confirmation of the appropriate solar system configuration

CHECK LIST

This check should be carried out after installation, it however is no guarantee that the system is fully installed correctly and should only act as a guide.

<u>Mechanical:</u>		
<u>Solar:</u>		
The pipe-work is connected correctly for the flow of the system. Check each unit.		
Lower cylinder coil connection should be connected to the pump side of the pump station at the flow meter.		
Check expansion vessels are connected and are NOT isolated and relief valve fitted and piped.		
Fill flush valve is fitted on return to the solar pump between vessel and solar station and is at lowest level for solar pipe-work		
Air eliminator is fitted in return to Collectors after pump (when installed)		
Pump station is fitted correctly with pump on return to the collectors.		
Pipe-work is correct size and no solder is used.		
<u>Collectors</u>		
Collectors are installed at correct angle and orientation		
The temperature sensor is fitted and wired, in flow from the collector array (last unit)		
More than 6 collectors in series require an expansion piece.		
The collectors have been left covered if not filled with heat transfer fluid		
<u>DHW</u>		
Expansion and expansion relief valve fitted		
Pressure temperature relief valve fitted on the cylinder(s)		
Appropriate cold water feed kit fitted.		
Destratification or shunt pump fitted and wired to panel (if required)		
Recirculation pump fitted and wired.		
Cylinder, sensors are located in upper and lower (where required) section and connected		
<u>Electrical</u>		
Ensure all wiring is secure and at present power supplies are isolated.		
For immersion heaters and very large pumps ensure wiring and supply is sized appropriate. Immersion heaters generate much larger loads than the standard solar system.		
The power to the controller can be switched off easily and locally.		
Extra 230v power supply is available locally.		

PART OF BDR THERMEA



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